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SEQUENCE LISTING

<110> Nihon Nohyaku Co., Ltd.

<120> NOVEL PROTOPORPHYRINOGEN OXIDASE TOLERANT TO PHOTOBLEACHING HERBICIDE

<130> Q58140

<140> 09/508,418

<141> 2000-03-13

<150> JP 9-265084

<151> 1997-09-11

<160> 11

<170> PatentIn version 3.0

<210> 1

<211> 1874

<212> DNA

<213> Nicotiana tabacum

<220>

<221> exon

<222> (26)..(1672)

<220>

<221> misc_feature

<223> Strain name: Xanthi NC

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Pro	Asn	Ile	Phe	Thr	His	Gln	Ser	Ser	Ser	Ser	Pro	Leu	Ala	Phe	Leu	
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aac	cgt	acg	agt	ttc	atc	cct	ttc	tct	tca	atc	tcc	aag	cgc	aat	agt	148
Asn	Arg	Thr	Ser	Phe	Ile	Pro	Phe	Ser	Ser	Ile	Ser	Lys	Arg	Asn	Ser	
				30					35					40		
gtc	aat	tgc	aat	ggc	tgg	aga	aca	cga	tgc	tcc	gtt	gcc	aaa	gat	tac	196
Val	Asn	Cys	Asn	Gly	Trp	Arg	Thr	Arg	Cys	Ser	Val	Ala	Lys	Asp	Tyr	
			45					50					55			
aca	gtt	cct	tcc	tca	gcg	gtc	gac	ggc	gga	ccc	gcc	gcg	gag	ctg	gac	244
Thr	Val	Pro	Ser	Ser	Ala	Val	Asp	Gly	Gly	Pro	Ala	Ala	Glu	Leu	Asp	
		60					65					70				
tgt	gtt	ata	gtt	gga	gca	gga	att	agt	ggc	ctc	tgc	att	gcg	cag	gtg	292
Cys	Val	Ile	Val	Gly	Ala	Gly	Ile	Ser	Gly	Leu	Cys	Ile	Ala	Gln	Val	

75	80	85	
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Met Ser Ala Asn Tyr Pro Asn Leu Met Val Thr Glu Ala Arg Asp Arg			
90	95	100	105
gcc ggt ggc aac ata acg act gtg gaa aga gac ggc tat ttg tgg gaa			388
Ala Gly Gly Asn Ile Thr Thr Val Glu Arg Asp Gly Tyr Leu Trp Glu			
	110	115	120
gaa ggt ccc aac agt ttc cag ccg tcc gat cct atg ttg act atg gca			436
Glu Gly Pro Asn Ser Phe Gln Pro Ser Asp Pro Met Leu Thr Met Ala			
	125	130	135
gta gat tgt gga ttg aag gat gat ttg gtg ttg gga gat cct aat gcg			484
Val Asp Cys Gly Leu Lys Asp Asp Leu Val Leu Gly Asp Pro Asn Ala			
	140	145	150
ccc cgt ttc gtt ttg tgg aag ggt aaa tta agg ccc gtc ccc tca aaa			532
Pro Arg Phe Val Leu Trp Lys Gly Lys Leu Arg Pro Val Pro Ser Lys			
	155	160	165
ctc act gat ctt ccc ttt ttt gat ttg atg agc att cct ggc aag ttg			580
Leu Thr Asp Leu Pro Phe Phe Asp Leu Met Ser Ile Pro Gly Lys Leu			
170	175	180	185
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Arg Ala Gly Phe Gly Pro Ile Gly Leu Arg Pro Ser Pro Pro Gly His			
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Phe Glu Arg Leu Ile Glu Pro Phe Cys Ser Gly Val Tyr Ala Gly Asp			
	220	225	230
ccc tca aaa ctg agt atg aaa gca gca ttt ggg aaa gtt tgg aag ttg			772
Pro Ser Lys Leu Ser Met Lys Ala Ala Phe Gly Lys Val Trp Lys Leu			
	235	240	245
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Glu Glu Thr Gly Gly Ser Ile Ile Gly Gly Thr Phe Lys Ala Ile Lys			
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Pro Lys Gly Gln Thr Val Gly Ser Phe Arg Lys Gly Leu Arg Met Leu			
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Lys Leu Ser Ser Ile Thr Lys Ser Glu Lys Gly Gly Tyr His Leu Thr	
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Tyr Glu Thr Pro Glu Gly Val Val Ser Leu Gln Ser Arg Ser Ile Val	
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Val Ala Ala Ala Asp Ala Leu Ser Asn Phe Tyr Tyr Pro Pro Val Gly	
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gca gtc aca att tca tat cct caa gaa gct att cgt gat gag cgt ctg	1204
Ala Val Thr Ile Ser Tyr Pro Gln Glu Ala Ile Arg Asp Glu Arg Leu	
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 Gly Leu Arg Pro Ser Pro Pro Gly His Glu Glu Ser Val Glu Gln Phe
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 Ser Phe Arg Lys Gly Leu Arg Met Leu Pro Asp Ala Ile Ser Ala Arg
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 Ser Glu Lys Gly Gly Tyr His Leu Thr Tyr Glu Thr Pro Glu Gly Val
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 Val Ser Leu Gln Ser Arg Ser Ile Val Met Thr Val Pro Ser Tyr Val
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 Ser Asn Phe Tyr Tyr Pro Pro Val Gly Ala Val Thr Ile Ser Tyr Pro
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 Gln Glu Ala Ile Arg Asp Glu Arg Leu Val Asp Gly Glu Leu Lys Gly
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 Phe Gly Gln Leu His Pro Arg Thr Gln Gly Val Glu Thr Leu Gly Thr
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 Ile Tyr Ser Ser Ser Leu Phe Pro Asn Arg Ala Pro Lys Gly Arg Val
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Tyr Ala Tyr Lys
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<210> 3

<211> 1874

<212> DNA

<213> Nicotiana tabacum

<220>

<221> exon

<222> (26)..(1672)

<220>

<221> misc_feature

<223> Strain name: SR1

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Asn Arg Thr Ser Phe Ile Pro Phe Ser Ser Ile Ser Lys Arg Asn Ser
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Met Ser Ala Asn Tyr Pro Asn Leu Met Val Thr Glu Ala Arg Asp Arg	
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Ala Gly Gly Asn Ile Thr Thr Val Glu Arg Asp Gly Tyr Leu Trp Glu	
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Glu Gly Pro Asn Ser Phe Gln Pro Ser Asp Pro Met Leu Thr Met Ala	
125 130 135	
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Val Asp Cys Gly Leu Lys Asp Asp Leu Val Leu Gly Asp Pro Asn Ala	
140 145 150	
ccc cgt ttc gtt ttg tgg aag ggt aaa tta agg ccc gtc ccc tca aaa	532
Pro Arg Phe Val Leu Trp Lys Gly Lys Leu Arg Pro Val Pro Ser Lys	
155 160 165	
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Leu Thr Asp Leu Pro Phe Phe Asp Leu Met Ser Ile Pro Gly Lys Leu	
170 175 180 185	
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Arg Ala Gly Phe Gly Ala Ile Gly Leu Arg Pro Ser Pro Pro Gly His	
190 195 200	
gag gaa tca gtt gag cag ttc gtg cgt cgt aat ctt ggt ggc gaa gtc	676
Glu Glu Ser Val Glu Gln Phe Val Arg Arg Asn Leu Gly Gly Glu Val	
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ttt gaa cgc ttg ata gaa cca ttt tgt tct ggt gtt tat gtt ggt gat	724
Phe Glu Arg Leu Ile Glu Pro Phe Cys Ser Gly Val Tyr Val Gly Asp	
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Pro Ser Lys Leu Ser Met Lys Ala Ala Phe Gly Lys Val Trp Lys Leu	
235 240 245	
gaa gaa act ggt ggt agc att att gga gga acc ttt aaa gca ata aag	820
Glu Glu Thr Gly Gly Ser Ile Ile Gly Gly Thr Phe Lys Ala Ile Lys	
250 255 260 265	
gag aga tcc agt aca cct aaa gcg ccc cgc gat ccg cgt tta cct aaa	868
Glu Arg Ser Ser Thr Pro Lys Ala Pro Arg Asp Pro Arg Leu Pro Lys	
270 275 280	

cca aaa gga cag aca gtt gga tca ttc agg aag ggt ctc aga atg ctg	916
Pro Lys Gly Gln Thr Val Gly Ser Phe Arg Lys Gly Leu Arg Met Leu	
285 290 295	
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Pro Asp Ala Ile Ser Ala Arg Leu Gly Ser Lys Leu Lys Leu Ser Trp	
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Lys Leu Ser Ser Ile Thr Lys Ser Glu Lys Gly Gly Tyr His Leu Thr	
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Tyr Glu Thr Pro Glu Gly Val Val Ser Leu Gln Ser Arg Ser Ile Val	
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Met Thr Val Pro Ser Tyr Val Ala Ser Asn Ile Leu Arg Pro Leu Ser	
350 355 360	
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Val Ala Ala Ala Asp Ala Leu Ser Asn Phe Tyr Tyr Pro Pro Val Gly	
365 370 375	
gca gtc aca att tca tat cct caa gaa gct att cgt gat gag cgt ctg	1204
Ala Val Thr Ile Ser Tyr Pro Gln Glu Ala Ile Arg Asp Glu Arg Leu	
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Lys Asn Pro Glu Ile Leu Ser Lys Thr Glu Ser Gln Leu Val Glu Val	
445 450 455	
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460 465 470	
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Leu Val Gly His Leu Asp Thr Leu Ser Thr Ala Lys Ala Ala Met Asn	

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Val Ala Leu Gly Arg Cys Val Glu Gly Ala Tyr Glu Val Ala Ser Glu	525	530	535	
gta aca gga ttt ctg tct cgg tat gca tac aaa tga aacctgtgtt				1682
Val Thr Gly Phe Leu Ser Arg Tyr Ala Tyr Lys	540	545		
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aaaagttttg ctccattagag ttatttttagc cttggtaaatt gatttgtact tgatatcagt				1802
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Arg Cys Ser Val Ala Gly Gly Pro Thr Val Gly Ser Ser Lys Ile Glu
35 40 45
Gly Gly Gly Gly Thr Thr Ile Thr Thr Asp Cys Val Ile Val Gly Gly
50 55 60
Gly Ile Ser Gly Leu Cys Ile Ala Gln Ala Leu Ala Thr Lys His Pro
65 70 75 80
Asp Ala Ala Pro Asn Leu Ile Val Thr Glu Ala Lys Asp Arg Val Gly
85 90 95
Gly Asn Ile Ile Thr Arg Glu Glu Asn Gly Phe Leu Trp Glu Glu Gly
100 105 110
Pro Asn Ser Phe Gln Pro Ser Asp Pro Met Leu Thr Met Val Val Asp
115 120 125
Ser Gly Leu Lys Asp Asp Leu Val Leu Gly Asp Pro Thr Ala Pro Arg
130 135 140
Phe Val Leu Trp Asn Gly Lys Leu Arg Pro Val Pro Ser Lys Leu Thr
145 150 155 160
Asp Leu Pro Phe Phe Asp Leu Met Ser Ile Gly Gly Lys Ile Arg Ala
165 170 175
Gly Phe Gly Ala Leu Gly Ile Arg Pro Ser Pro Pro Gly Arg Glu Glu
180 185 190
Ser Val Glu Glu Phe Val Arg Arg Asn Leu Gly Asp Glu Val Phe Glu
195 200 205
Arg Leu Ile Glu Pro Phe Cys Ser Gly Val Tyr Ala Gly Asp Pro Ser
210 215 220
Lys Leu Ser Met Lys Ala Ala Phe Gly Lys Val Trp Lys Leu Glu Gln
225 230 235 240
Asn Gly Gly Ser Ile Ile Gly Gly Thr Phe Lys Ala Ile Gln Glu Arg
245 250 255
Lys Asn Ala Pro Lys Ala Glu Arg Asp Pro Arg Leu Pro Lys Pro Gln
260 265 270

Gly Gln Thr Val Gly Ser Phe Arg Lys Gly Leu Arg Met Leu Pro Glu
 275 280 285

Ala Ile Ser Ala Arg Leu Gly Ser Lys Val Lys Leu Ser Trp Lys Leu
 290 295 300

Ser Gly Ile Thr Lys Leu Glu Ser Gly Gly Tyr Asn Leu Thr Tyr Glu
 305 310 315 320

Thr Pro Asp Gly Leu Val Ser Val Gln Ser Lys Ser Val Val Met Thr
 325 330 335

Val Pro Ser His Val Ala Ser Gly Leu Leu Arg Pro Leu Ser Glu Ser
 340 345 350

Ala Ala Asn Ala Leu Ser Lys Leu Tyr Tyr Pro Pro Val Ala Ala Val
 355 360 365

Ser Ile Ser Tyr Pro Lys Glu Ala Ile Arg Thr Glu Cys Leu Ile Asp
 370 375 380

Gly Glu Leu Lys Gly Phe Gly Gln Leu His Pro Arg Thr Gln Gly Val
 385 390 395 400

Glu Thr Leu Gly Thr Ile Tyr Ser Ser Ser Leu Phe Pro Asn Arg Ala
 405 410 415

Pro Pro Gly Arg Ile Leu Leu Leu Asn Tyr Ile Gly Gly Ser Thr Asn
 420 425 430

Thr Gly Ile Leu Ser Lys Ser Glu Gly Glu Leu Val Glu Ala Val Asp
 435 440 445

Arg Asp Leu Arg Lys Met Leu Ile Lys Pro Asn Ser Thr Asp Pro Leu
 450 455 460

Lys Leu Gly Val Arg Val Trp Pro Gln Ala Ile Pro Gln Phe Leu Val
 465 470 475 480

Gly His Phe Asp Ile Leu Asp Thr Ala Lys Ser Ser Leu Thr Ser Ser
 485 490 495

Gly Tyr Glu Gly Leu Phe Leu Gly Gly Asn Tyr Val Ala Gly Val Ala
 500 505 510

Leu Gly Arg Cys Val Glu Gly Ala Tyr Glu Thr Ala Ile Glu Val Asn
 515 520 525

Asn Phe Met Ser Arg Tyr Ala Tyr Lys
 530 535